blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer readable program instructions.

[0073] These computer readable program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks. These computer readable program instructions may also be stored in a computer readable storage medium that can direct a computer, a programmable data processing apparatus, and/or other devices to function in a particular manner, such that the computer readable storage medium having instructions stored therein comprises an article of manufacture including instructions which implement aspects of the function/act specified in the flowchart and/or block diagram block or blocks.

[0074] The computer readable program instructions may also be loaded onto a computer, other programmable data processing apparatus, or other device to cause a series of operational steps to be performed on the computer, other programmable apparatus or other device to produce a computer implemented process, such that the instructions which execute on the computer, other programmable apparatus, or other device implement the functions/acts specified in the flowchart and/or block diagram block or blocks.

[0075] The flowchart and block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods, and computer program products according to various embodiments of the present invention. In this regard, each block in the flowchart or block diagrams may represent a module, segment, or portion of instructions, which comprises one or more executable instructions for implementing the specified logical function(s). In some alternative implementations, the functions noted in the block may occur out of the order noted in the figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block diagrams and/or flowchart illustration, and combinations of blocks in the block diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts or carry out combinations of special purpose hardware and computer instructions.

[0076] The descriptions of the various embodiments of the present invention have been presented for purposes of illustration, but are not intended to be exhaustive or limited to the embodiments disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the described embodiments. The terminology used herein was chosen to best explain the principles of the embodiments, the practical application or technical improvement over technologies found in the marketplace, or to enable others of ordinary skill in the art to understand the embodiments disclosed herein.

What is claimed is:

1. A computer-implemented method for converting a procedural process model for a process to a hybrid process model, comprising:

selectively clustering a plurality of steps of the process which are included in the procedural process model, according to a historical execution information of the plurality of steps, to generate a plurality of candidate cluster sets;

selecting one candidate cluster set satisfying a first condition from the plurality of candidate cluster sets; and

converting the procedural process model into the hybrid process model according to the selected candidate cluster set.

2. The computer-implemented method of claim **1**, further comprising:

determining the historical execution information of the plurality of steps according to a plurality of history logs associated with a historical execution of the process.

3. The computer-implemented method of claim **2**, wherein the historical execution information of the plurality of steps includes at least one of ratios of history logs in which connections between the plurality of steps occur to the plurality of history logs, ratios of history logs in which common data items for the respective steps occur to the plurality of history logs, and ratios of history logs in which common roles for the respective steps occur to the plurality of history logs.

4. The computer-implemented method of claim **1**, wherein the selectively clustering a plurality of steps of the process which are included in the procedural process model, according to historical execution information of the plurality of steps, to generate a plurality of candidate cluster set comprises:

determining correlation degrees between a plurality of clusters which the plurality of steps act as respectively; and

clustering clusters whose correlation degree satisfies a second condition, to generate a first candidate cluster set including a plurality of clusters.

5. The computer-implemented method of claim **4**, wherein the selectively clustering a plurality of steps of the process which are included in the procedural process model, according to the historical execution information of the plurality of steps, to generate a plurality of candidate cluster set further comprises:

determining correlation degrees between the respective clusters in the first candidate cluster set; and

clustering clusters whose correlation degree satisfies a third condition, to generate a second candidate cluster set including a plurality of clusters.

6. The computer-implemented method of claim **1**, wherein the selecting one candidate cluster set satisfying a first condition from the plurality of candidate cluster sets comprises:

calculating clustering qualities of the plurality of candidate cluster sets; and

selecting one candidate cluster set based on the clustering qualities, as the candidate cluster set satisfying the first condition, from the plurality of candidate cluster sets.

7. The computer-implemented method of claim **6**, wherein a clustering quality of a candidate cluster set increases in response to that correlation degrees between respective clusters in the candidate cluster set decrease, or in